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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Zhigang Qi

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EXAMINER

CHUO, TONY SHENG HSIANG

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/736,480	Applicant(s) QI ET AL.	
	Examiner Tony Chuo	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-23 and 33-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-23 and 33-42 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1, 4-23, and 33-42 are currently pending. Claims 2, 3, and 24-32 have been cancelled. New claims 40-42 have been added. The previously stated objection to claim 2 is withdrawn. The amended claims do overcome the previously stated 102 and 103 rejections. However, upon further consideration, claims 1, 4-23, and 33-42 are rejected under the following new 103 rejections. This action is made FINAL as necessitated by the amendment.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 4-6, 10-13, 18-22, and 33-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menashi (US 2003/0022055) and as evidenced by Belmont et al (US 5851280).

The Menashi reference discloses a fuel cell "5" comprising a solid membrane "30" such as Nafion 117, an anode backing layer "14", and a cathode backing layer "16" (See paragraph [0053]). In addition, it also discloses that the active layer and blocking layer that may be present in gas diffusion electrodes can both include modified carbon

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products that promotes hydrophilic characteristics by attaching a hydrophilic organic group that has a) a C₁-C₁₂ alkyl group and b) at least one acidic group such as sulfonic acid group (-SO₃H) (See paragraphs [0039],[0040],[0055]). In addition, it also discloses a catalyst layer/Toray paper combination that are both treated with sulfanilic acid to attach -C₆H₄SO₃H to the carbon support (See paragraph [0062]). This further supports the teaching that both the active layer (catalyst layer) and the blocking layer (gas diffusion layer) are treated to include the modified carbon products. Examiner's note: It is well known in the art that fuel cells comprise anode flow plates and cathode flow plates. It is inherent that the aqueous permeability of the treated carbon paper is greater than the aqueous permeability of the carbon paper because the treated carbon paper is more hydrophilic than the untreated carbon paper. It is inherent that the treated gas diffusion layer has an initial contact angle with water of less than about 125° because the treated gas diffusion layer is hydrophilic.

It also discloses a gas diffusion electrode comprising a binder such as Nafion which is a proton conducting material comprising perfluorinated sulfonic acid (See paragraph [0026]).

It also discloses a gas diffusion layer that is Toray carbon paper (See paragraph [0058]).

It also discloses using the modified carbon products in direct methanol fuel cells (See paragraph [0054]).

As evidenced by Belmont et al, which is incorporated by reference by the Menashi reference, it also discloses carbon black (diffusion layer) having an organic

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group attached to the carbon black, wherein the organic group may be an aliphatic group that includes alkenes (alkenyl moiety) and a functional group that includes COOH, SO₃H, or H₂PO₃ (See column 6, lines 4-43).

However, Menashi does not expressly teach a sulfonic acid moiety covalently bonded to the fuel cell diffusion layer, wherein the sulfonic acid moiety has the formula RSO₃H, and wherein R is an alkenyl moiety substituted with halogen or an alkenyl moiety substituted with fluorine.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Menashi fuel cell diffusion layer to include a sulfonic acid moiety covalently bonded to the fuel cell diffusion layer, wherein the sulfonic acid moiety has the formula RSO₃H, and wherein R is an alkenyl moiety substituted with halogen or an alkenyl moiety substituted with fluorine because the substitution of a halogen for a hydrogen was held to have been obvious (*Ex parte Dole* 119 USPQ 260 (PO BdPatApp 1957)).

However, Menashi does not expressly teach an alkenyl moiety comprising a C₂-C₁₀ alkenyl, a C₂-C₆ alkenyl, or a C₂-C₃ alkenyl. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Menashi fuel cell diffusion layer to include an alkenyl moiety comprising a C₂-C₁₀ alkenyl, a C₂-C₆ alkenyl, or a C₂-C₃ alkenyl because in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art", a prima facie case of obviousness exists (See *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976)).

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4. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menashi (US 2003/0022055) as evidenced by Belmont et al (US 5851280) as applied to claim 1 above, and further in view of Denton et al (EP 0791974).

However, Menashi does not expressly teach a fuel cell diffusion layer comprising a catalyst that is Pt wherein the fuel cell diffusion layer comprises from about one weight percent to about 50 weight percent of the catalyst. The Denton reference discloses a catalytically active gas diffusion electrode comprising a catalyst that is 40 wt% platinum supported on carbon black (See Example 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Menashi diffusion layer to include a catalyst that is Pt wherein the fuel cell diffusion layer comprises from about one weight percent to about 50 weight percent of the catalyst in order to provide a gas diffusion electrode with increased dimensional stability and flexibility that can be produced at a lower cost.

5. Claims 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Menashi (US 2003/0022055) as evidenced by Belmont et al (US 5851280) as applied to claim 1 above.

However, Menashi does not expressly teach an article that has an initial contact angle with water that is at least about 15%, 20%, 30%, or 40% less than an initial contact angle of water with the diffusion layer.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Menashi fuel cell to include an article that has an initial contact angle with water that is at least about 15%, 20%, 30%, or 40% less than

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an initial contact angle of water with the diffusion layer because the parameter optimized is recognized in the art to be a result effective variable (In re Boesch, 617 F2d 272, 205 USPQ 215 (CCPA 1980)). The initial contact angle is a result of varying the degree of hydrophilicity of the diffusion layer. In addition, Menashi also teaches controlling the amount of hydrophilic organic groups attached to the carbon product to avoid making a modified carbon product that is overly hydrophilic (See paragraph [0044]).

6. Claim 23 are rejected under 35 U.S.C. 103(a) as being obvious over Menashi (US 2003/0022055) as evidenced by Belmont et al (US 5851280) as applied to claim 18 above, and further in view of Reddy et al (US 5132193).

However, Menashi does not expressly teach a fuel cell that is a direct propanol fuel cell. The Reddy reference discloses a direct alcohol fuel cell that is a direct feed liquid fuel cell utilizing all C₁-C₅ primary alcohols such as methanol and propanol as the fuel (See column 3, lines 15-21).

Therefore, all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded nothing more than predictable results to one of ordinary skill in the art at the time of the invention.

Response to Arguments

7. Applicant's arguments with respect to claims 1, 4-23, and 33-39 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571)272-0717. The examiner can normally be reached on M-F, 7:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for

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the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

/Jonathan Crepeau/
Primary Examiner, Art Unit 1795